

DEVELOPMENT OF PRESSURIZED CIRCULATING FLUIDIZED BED PARTIAL GASIFICATION MODULE (PGM)

PRIMARY PARTNER

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Livingston, NJ

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Praxair
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Reaction Engineering International
Salt Lake City, UT

Corning
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ADA Technologies
Littleton, CO

WEB SITE

www.netl.doe.gov

Description

Foster Wheeler Development Corporation (FW) of Livingston, New Jersey, together with Nexant, a subsidiary of Bechtel, Praxair, Reaction Engineering International, Corning and ADA Technology, will develop a pressurized circulating fluidized bed partial gasification module (PGM) that represents a critical element of several potential Vision 21 plants.

FW advocates the use of the partial gasification module because it offers all the advantages of gasifying fossil fuels, while providing significant fuel flexibility and the ability to accommodate the most advanced steam turbines and gas turbines.

PGM is a robust module, in that its performance in achieving overall efficiency goals will not be affected by the carbon conversion achieved in the PGM. For certain fuels (e.g., biomass and other low-rank fuels), PGM will simply operate as a full gasifier; whereas for other fuels, the char generated in the PGM will be combusted in high-efficiency advanced-combustion modules.

PGM-based Vision 21 plants would be able to generate electric power from coal at thermal efficiencies over 60% and meet stringent environmental requirements. Such a plant could be used to co-produce clean liquid fuels or chemical coproducts, or it could also utilize oxygen-firing to render the plant suitable for easy CO₂ sequestration. Furthermore, the circulating fluidized bed technology allows simpler scale-up than the current bubbling, jetting bed gasifier technology.

Included in the PGM technology project is the development of a novel high-temperature honeycomb-type filter subsystem. This filter subsystem has demonstrated excellent performance in testing with the exhaust of a pressurized fluid bed combustor for over 1,000 hours. Similar performance is expected in its operation with the reducing environment of the exhaust of a partial gasifier.

Goals

Foster Wheeler will design and test a pilot-scale pressurized circulating fluidized-bed partial gasifier together with a ceramic honeycomb filter in support of an advanced Vision 21 plant. The partial gasifier and high-temperature particulate filter form what is referred to as the partial gasification module (PGM). The experimental test program will include the following:

- Air blown tests with bituminous coal followed by co-firing with petroleum coke, and biomass
- Use of pure oxygen and CO₂ in the partial gasifier to determine their effect on overall fuel gas quality and overall hydrodynamic performance



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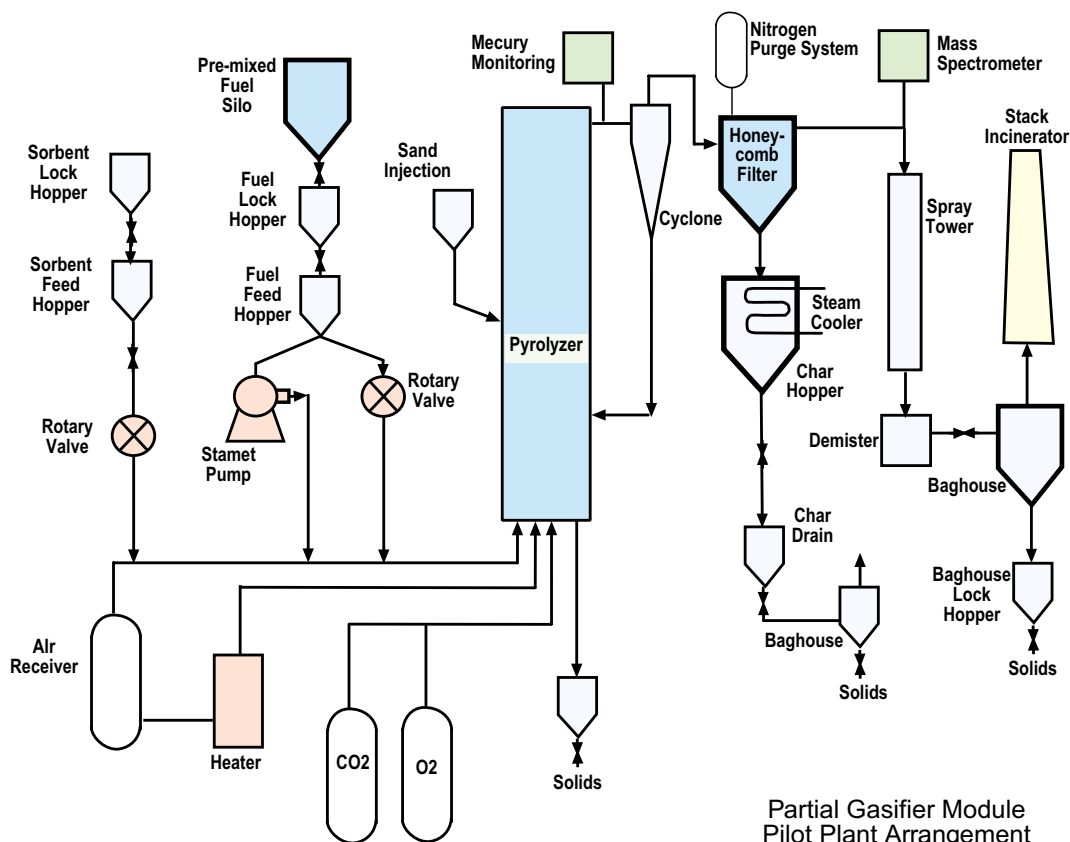
Goals (continued)

- High-temperature (up to 1,800 °F) evaluation of an innovative honeycomb filter system
- Testing of an innovative fuel delivery system (STAMET pump) for pressurized operation
- An advanced monitoring system for detecting mercury emissions will be used to gain the operating experience to pursue early development of the PGM in repowering applications as well as future commercial application.

Benefits

PGM-based Vision 21 plants in several configurations will satisfy all of the following specific performance targets of the Vision 21 program:

- Net efficiency (electrical generation) greater than 60% for coal-based systems (HHV)
- Near-zero emissions of traditional pollutants, including smog and acid-rain-forming species
- Greater than 40% reductions in CO₂ emissions by efficiency improvement; 100% reduction with sequestration



Partial Gasifier Module
Pilot Plant Arrangement

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